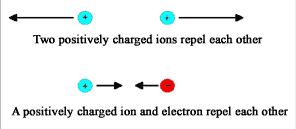
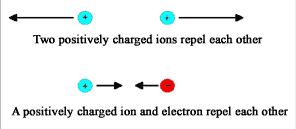
**Grade 9 Science: Electricity By: Anu Jain, Jasmine Chong, Rinkal Patel**

**Electric charge –** A negative or positive amount of electricity that builds up in an object. All atoms contain electric charges.

**Law of Electric Charges**

Like charges repel Opposite charges attract



**How do objects become charged?**

**Charging by Friction –** When two materials rub together to produce an electric charge. Materials that have a weak hold on electrons will become positively charged when they rub against materials that have a strong hold on electrons. *See Electrostatic Series*

**Electrostatic Series**

Sulphur

Brass

Copper

Ebonite

Paraffin Wax

Silk

Lead

Fur

Wool

Glass

Increasing tendency to hold on to electrons

(negatively-charged)

**Strong Hold on Electrons**

**Charging by Conduction –** When a charged object touches an uncharged object, the extra electrons in the charged object will transfer to the uncharged object.

**Charging by Induction –** When a charged object induces movement of electrons in an uncharged object without direct contact.

**Weak Hold on Electrons**

**Insulators vs. Conductors**

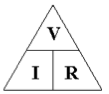
**Insulators –** Materials in which electrons do not move freely. Ex: Oil, Fur, Silk, Rubber, Wax, Plastic

**Conductors –** Materials in which electrons move freely. Ex. Silver, Copper, Gold, Aluminum, Iron, Nickel

**What is Current Electricity?**

**Current electricity –** The movement of electric charge from one place to another

|  |  |  |  |
| --- | --- | --- | --- |
| **Term** | **Definition** | **Unit** | **Measurement Device** |
| **Voltage (V)** | The electric potential per charge moving between terminals | Volts (V) | Voltmeter |
| **Current (I)** | The measure at which electric charges moves past a given point in a circuit | Amperes (A) | Ammeter |
| **Resistance (R)** | The measure of an objects opposition to the passage of a steady electric current | Ohms (Ω) | Ohmmeter |



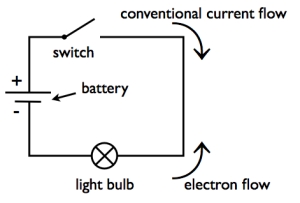
**Ohm’s Law**

*“The potential difference between two points on a conductor is directly related to the electric current flowing through the conductor” –George Ohm (1789-1854)*

Potential difference = Electric current x Electrical resistance

V = I x R

**Circuits**



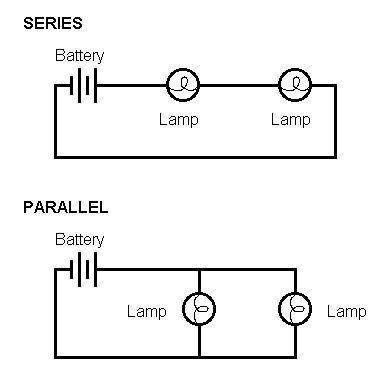
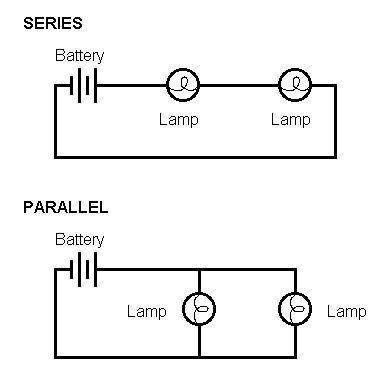
**Electric circuit –** Controlled path of flowing electricity in a complete circle

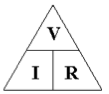
Features of an electric circuit:

1. Source – Where the electricity comes from
2. Load: Where the electrical energy is transferred and converted
3. Control: A switch that starts and stops the electricity
4. Connectors: The paths where the electricity runs

**Parallel Circuit –** Two or more paths for electric charge to follow (branches)

**Series Circuit –** One path of electric charge



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**Generating and Using Electricity:**

**Types of Electric Current:**

**Direct Current (DC):** Current in which charged particles travel through a circuit in only one direction

**Alternating Current (AC):**

Current in which electrons move back and forth in a circuit

**Electricity at Home:**

From the Power station electrical energy comes through

power grid where it first enters electrical meter and through

distribution panel reaches each outlet through circuit.

**Power Ratings on Appliances:**

Each appliance has typical power rating on the label which helps us calculate the cost of using the appliance based on the rate.

**Electrical Power** = the rate at which an appliance uses electrical energy

**Electrical Energy** = the energy that is used by an appliance at a given setting; determined by multiplying the power rating of an appliance by the length of time it is used

Efficiency of an electrical device is the ratio of useful energy output to the total energy input, expressed as percentage.

kW.h is the practical unit of electrical energy

**Kilowatt-hour (kW.h)** = power (kW) x time (h)= J

**Watt (W)** = a unit of electrical power

**Percent Efficiency** = useful energy output x 100%

Total energy input

**Meeting the Demands of Electricity:**

|  |  |  |
| --- | --- | --- |
| **Load: demand of electrical power** | | |
| **Base Load** | **Intermediate Load** | **Peak Load** |
| the continuous minimum demand for electrical power | electricity demand higher than base load | greatest electricity demand |
| Met by large reliable generator | Met by burning coal and natural gas | Met by using hydroelectric power and natural gas |
| Least expensive (4.0 Cents/kW.h) | Medium price (7.2 Cents/kW.h) | Higher price (8.8 Cents/kW.h) |

**Sustainable Sources of Electricity:**

|  |  |
| --- | --- |
| **Sources of Energy** | |
| **Renewable** | **Non-renewable** |
| A source of energy that can be replaced in relatively short period of time  Examples: Ocean Wave Energy, Tidal Energy, Biomass Energy, Geothermal Energy, Solar Energy | A source of energy that cannot be replaced as quickly as it is used  Examples: Energy from burning coal, Energy from natural gas, Nuclear Fuel Energy |